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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/604,488

07/25/2003

David M. Dobuzinsky

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7590

02/14/2005

EXAMINER

MAI, ANH D

INTERNATIONAL BUSINESS MACHINES CORPORATION  
DEPT. 18G  
BLDG. 300-482  
2070 ROUTE 52  
HOPEWELL JUNCTION, NY 12533

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 02/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	10/604,488		DOBUZINSKY ET AL.	
	<b>Examiner</b>		<b>Art Unit</b>	
	Anh D. Mai		2814	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 January 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2,4 and 6-20 is/are pending in the application.
- 4a) Of the above claim(s) 11-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4 and 6-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
       Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
       Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Status of the Claims***

1. Amendment filed January 13, 2005 has been entered. Claims 3 and 5 have been cancelled. Claim 1 has been amended. Claims 1, 2, 4, 6-20 are pending. Non-elected invention, claims 11-20 have been withdrawn.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1, 2, 4 and 6-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The amended claims 1 recites: "a Si-C barrier layer containing silicon-carbon bonds that does not have the structure of silicon carbide".

What is the silicon-carbon bonds structure that does not have the structure of silicon carbide ?

What is the silicon-carbon bonds structure ?

What is the silicon carbide structure ?

How are these structures different ?

Since the claims recite a structure different but does not provide for the basis of the differences, thus, the claim is indefinite.

*Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 4, 6, 7, 9 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Tsunashima et al. (U.S. Patent No. 6,326,658).

With respect to claim 1, as best understood by the examiner, Tsunashima teaches a deep trench capacitor in a monocrystalline semiconductor substrate as claimed including:

(i) a buried plate (6) in the substrate (1) about an exterior portion of a trench (3) in the substrate (1);

(ii) a node dielectric (7) about at least a lower interior portion of trench (3);

(iii) a trench electrode (8) in the trench (3); and

(iv) a conductive strap (11) disposed between and electrically connected to the trench electrode (8) and the monocrystalline substrate (1),

the capacitor of Tsunashima further comprises:

(v) a Si-C barrier layer (10) containing silicon-carbon bonds that does not have the structure of silicon carbide between the monocrystalline substrate (1) and the conductive strap (11). (See Fig. 1).

Note that, “silicon carbide” is a common name given to a Si-C material, or silicon oxide to Si-O material, or silicon nitride to Si-N.

Since the Si-C barrier layer 10 of Tsunashima is formed by passivating the silicon surface using  $C_2H_4$ , the structure of the Si-C barrier of Tsunashima meet the limitation of the claim.

Product by process limitation:

The expression “said Si-C barrier layer having been formed in the course of a plasma-assisted etch of an oxide layer adjacent to said monocrystalline substrate.” is/are taken to be a **product by process** limitation and is given no patentable weight. A product by process claim directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324, 326 (CCPA 1974); *In re Marosi et al.*, 218 USPQ 289, 292 (Fed. Cir. 1983); *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972); *In re Pilkington*, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935); and particularly *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product “gleaned” from the process steps, which must be determined in a “product by process” claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old and obvious product produced by a new method is not a patentable product, whether claimed in “product by process” claims or not.

**Note that Applicant has burden of proof in such cases** as the above case law makes clear.

With respect to claim 2, capacitor of Tsunashima further comprises an oxide collar (9) about an upper interior region of the trench (3) and disposed below the conductive strap (11).

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With respect to claims 4 and 10, the Si-C barrier layer (10) of Tsunashima is located at an interface between the conductive strap (11) and the monocrystalline substrate (1).

With respect to claim 6, the Si-C barrier layer (10) of Tsunashima has a thickness of about 10nm.

With respect to claim 7, the conductive strap (11) of Tsunashima is a buried strap.

With respect to claim 9, the trench electrode (8) of Tsunashima comprises doped polycrystalline silicon.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunashima '658 as applied to claim 1 above, and further in view of Chaloux et al. (U.S. Patent No. 6,194,736) of record.

Tsunashima teaches the buried strap 11 can be formed by filling an amorphous silicon film in trench 3 and changing the amorphous silicon film into a polysilicon film.

Thus, Tsunashima is shown to teach all the features of the claim with the exception of using amorphous silicon for the conductive strap.

However, Chaloux teaches that the buried strap or surface strap using amorphous silicon are well known in the art. (See col. 1, lines 26-41).

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Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to use amorphous silicon for the conductive strap of Tsunashima as taught by Chaloux without departing from the scope of the invention.

### *Response to Arguments*

5. Applicant's arguments with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection.

### *Conclusion*

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 9:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Anh D. Mai  
February 7, 2005

A handwritten signature in black ink, appearing to read 'Anh D. Mai', with a long, sweeping horizontal line extending to the right.